

Appl. No. 10/523,168
Reply to Office Action of July 6, 2007

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REMARKS/ARGUMENTS

Claim 7 is canceled.

Claim 3 is amended to clarify elements of the pressing apparatus and relationship between the elements.

More specifically, Claim 3 has been amended to clearly recite "upper heater block", "lower heater block", "upper pressing plate" and "lower pressing plate" instead of "heater blocks" and "pressing members" to make meaning clear.

And to make relationship between the elements clear, combination of "upper heater block" and "upper pressing plate" is defined as "upper block", and combination of "lower heater block" and "lower pressing plate" is defined as "lower block".

These amendments are based on the description of paragraph [00521 of the patent publication, (lines 11-19 in page 21) of the original specification), and do not contain a new matter.

Claim 3 has been also amended to clarify the structure of "step structure" (correspond to "protruding shape" before amendment) provided in either "upper pressing plate" or "lower pressing plate". Specifically, Claim 3 has been

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amended to recite the feature "step structure with periodic protruding parts satisfying quasi-phase matching condition for the quartz crystal".

These amendments are based on the description of paragraphs [0003]-[0006] of the patent publication (line 3 in page 2-line 8 in page 4 of the original specification) and [0061] of the patent publication (line 1 -10 in page 25 of the original specification), and do not contain a new matter.

Furthermore, Claim 3 is amended to include the features of Claim 7. By this amendment, Claim 3 contains "bearing block" that is an important element to cause "swinging mechanism" ("switching mechanism" is originally recited, but is a typographic error for "swinging mechanism"). "swinging mechanism" is caused by interfitting (engaging) of "bearing block" and "upper heating block".

In addition to the above amendments, a condition that "the upper heater block has a protruding part which is worked into a convex surface with a radius of R1" and "the bearing block has a recessed part with is worked into a concave surface with a radius of R2 ($R2 > R1$)" is recited in Claim 3. This condition is essential condition of interfitting (engaging) of "bearing block" and "upper

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heating block" (characteristics of original Claim 7).

These amendments are based on the description of paragraph [0054] of the patent publication (line 8-16 in page 22 of the original specification), and do not contain a new matter.

Claim 5 is amended to reflect the current wording of Claim 3.

Claim 7 (now in Claim 1) was rejected under 35USC section 112. This was due to a typographical error. "Switching mechanism" is changed to "swinging mechanism". Therefore, the reason of rejection has been eliminated.

The claims are rejected as anticipated by Shinma (U.S. Patent 6,471,501).

Claim 3 requires a "lower block" consisting of "lower heater block" and a "lower pressing plate"; "upper block" consisting of "upper heater block and "lower pressing plate"; and a "bearing block connecting to the upper heater block".

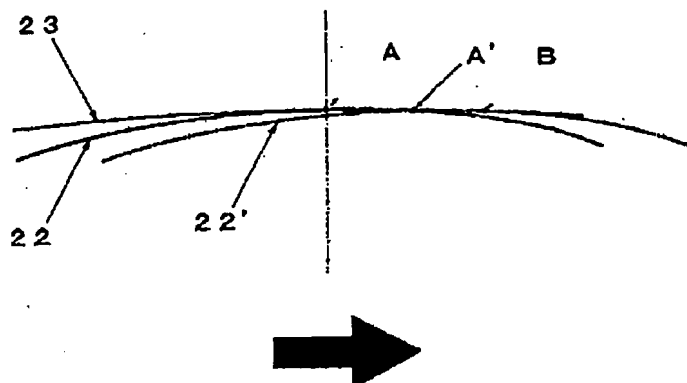
An important feature recited in Claim 3 is that "either the lower pressing plate or the upper pressing plate has a step structure with periodic protruding parts satisfying quasi-phase matching condition for the quartz crystal". By this first feature, because the quartz crystal

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is pressed only by periodic protruding parts, periodic twin structure is formed in the quartz crystal. Because of this first characteristic, any quartz crystal substrate is applicable to the present pressing apparatus without the need to form a step structure that has periodic protrusion on one side of the quartz crystal substrate in advance. As a result, the process of step working for each quartz crystal substrate can be omitted (see, paragraph [0061] of the patent publication (line 1 -10 in page 25 of the original specification)).

A second characteristic feature recited in Claim 3 is that "the upper heater block has a protruding part which is worked into a convex surface with a radius of R_1 , the bearing block has a recessed part with is worked into a concave surface with a radius of R_2 ($R_2 > R_1$), and the protruding part and the recessed part are engaged to generate a swinging mechanism". More detailed explanation is as below.

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The upper figure shows the engaging part of the upper heater block 14 and bearing block 20 enlarging. When pressing, because of the inclination of quartz crystal substrate, protruding part 22 is forced in the direction shown by arrow. Then the protruding part 22 is moved parallel along a recessed part 23 to become a protruding part 22'. Accordingly the center of protruding part 22 moves from A to A'. At that time, contact point of recessed part 23 and protruding part 22' moves from A to B, because of concave side of recessed part 23.

Therefore, pressure is transferred not from point A but from point B that is apart from the center A' of the protruding part 22'. As a result, non-uniform pressure that is strong in the downstream side of the arrow and is weak in the up stream side of the arrow, can be applied to the quartz crystal substrate.

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By requiring that the apparatus has such a swinging mechanism, the effect that "the pressing surface of the upper pressing plate 15 always conforms to the surface of the quartz crystal substrate 11 during pressing, so that a uniform load is applied to the quartz crystal substrate 11" can be obtained.

By using the pressing apparatus of Claim 3 that has both the first and the second characteristic features discussed above, a quartz crystal in which periodic twin structure is uniformly formed, can be obtained.

The examiner relies on Shinma to disclose a mold for making sealed resin with a press plate 23, a spherical bearing depression 26, and heaters 22, 71, 72. However Shinma fails to show or suggest the requirement, that "either the lower pressing plate or the upper pressing plate has a step structure with periodic protruding parts satisfying quasi-phase matching condition for the quartz crystal."

The difference between the inventive structure and that of Shinma is not surprising in view of different intended uses. For example, as the mold of Shimura is for making sealed resin, it is necessary to uniformly press semiconductor device 15. Claim 3 is not anticipated by

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Shinma, and the person skilled in the art can never have concept to press semiconductor device 15 only in the periodically protruding parts which satisfy quasi-phase matching condition.

More specifically, as described in lines 9 - 28 of column 5 of Shinma, even in case of sealing semiconductor device 15 that has bump electrodes, instead of using press plate 23 that has protruding parts satisfying quasi-phase matching condition, a spacer 30 between the heater 22 and the press plate 23 is used. Thus by generating flexion in the central part of the press plate 23, it is made possible to seal the semiconductor device 15 at the condition that the bump electrodes are exposed from the sealing resin.

As mentioned above, Shinma fails to disclose and suggest the first feature of Claim 3 ("either the lower pressing plate or the upper pressing plate has a step structure with periodic protruding parts satisfying quasi-phase matching condition for the quartz crystal").

As noted by the Examiner, Shinma discloses swinging mechanism comprising a balancer 21 with the spherical bearing depression 26, a spherical bearing projection 24 and a balance lock mechanism 25.

However, Shinma fails to teach the relationship of

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$R2 > R1$ in the second characteristic of Claim 3 ("the upper heater block has a protruding part which is worked into a convex surface with a radius of $R1$, the bearing block has a recessed part with is worked into a concave surface with a radius of $R2$ ($R2 > R1$), and the protruding part and the recessed part are engaged to generate a swinging mechanism").

As described in lines 29-52 of column 5, in Shinma, curvature of the spherical bearing projection 24 and curvature of a spherical bearing depression 26 of the balancer 21 are set equal and both of their radius are shown R . By this mechanism, the press plate 23 becomes movable against the balancer 21 around a rotating center A. This is the opposite required in Claim 3, as mentioned above, where the center of pressing can move at will. By this effect, even if force in the horizontal direction is applied, variable pressure (strong in one part and weak in the other parts) can be applied on the quartz crystal substrate. As a result above mentioned effects can be obtained.

As explained above, Shinma does not disclose the second characteristic feature of Claim 3 ("the upper heater block has a protruding part which is worked into a

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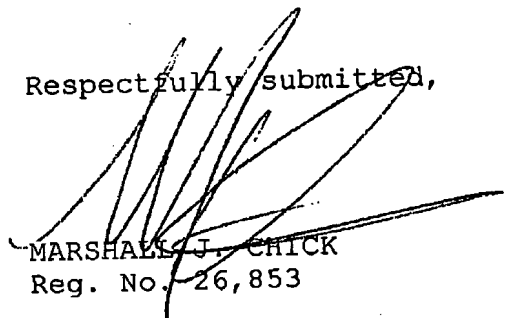
convex surface with a radius of R_1 , the bearing block has a recessed part with is worked into a concave surface with a radius of R_2 ($R_2 > R_1$), and the protruding part and the recessed part are engaged to generate a swinging mechanism").

Claims 5 and 6 are dependent Claims depending from Claim 3. As Claim 3 is novel and has inventive step over Shinma, Claims 5 and 6 also are novel and have inventive step over Shinma.

In view of the above, the rejections are avoided. Allowance of the application is therefore respectfully requested.

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